IN THE CLAIMS

1. (currently amended) A method of estimating a property of interest relating to an earth formation comprising:

(a) conveying a Nuclear Magnetic Resonance (NMR) logging tool into a borehole in said earth formation;

(b) applying a first pulse sequence having a first associated measurement frequency and measuring first signals corresponding to said first pulse sequence, said first signals including non-NMR signals resulting from (A) an excitation pulse, and, (B) a refocusing pulse in said first pulse sequence;

(c) applying a plurality of additional pulse sequences having associated additional frequencies different from each other and from said first frequency;

(d) measuring additional signals resulting from applying said plurality of additional pulse sequences; ~~and~~

(e) determining from said first and said additional measured signals an estimate of said property of interest, said estimate substantially unaffected by said non-NMR signals; and

(f) recording the estimate of the property of interest on a suitable medium;

wherein the first and the additional frequencies are related by an expression of the form

$$\underline{nf \cdot \delta f = \frac{m}{t}}$$

<u>where δf is a separation of frequencies, nf is the number of frequencies, m is any integer that is not a multiple of nf, and t is a time over which a phase difference evolves.</u>

2. (Currently amended) The method of ~~claim 40~~ <u>claim 1</u> wherein said first and said additional frequencies are related by an expression of the form

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where TE is an interecho spacing<u>.</u>

3. (Currently amended) The method of ~~claim 40~~ <u>claim 1</u> wherein said first and said additional frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{1}{TE}$$

where TE is an interecho spacing.

4. (Previously presented) The method of claim 1 wherein a phase of said non-NMR signals resulting from said first pulse sequence and phases of non-NMR signals resulting from said additional pulse sequences are substantially evenly distributed around a unit circle.

5. (previously presented) The method of claim 1 wherein at least one of said first pulse sequence and said additional pulse sequences comprises a CPMG sequence.

6. (original) The method of claim 5 wherein said first and said additional frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

7. (original) The method of claim 5 wherein said first and said additional frequencies are related by an expression of the form;

$$nf \cdot \delta f = \frac{1}{TE}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

8. (original) The method of claim 1 wherein at least one of said first pulse sequence and said additional pulse sequences comprises a modified CPMG sequence having a refocusing pulse with a tipping angle of less than 180°.

9. (original) The method of claim 8 wherein said first and said additional frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

10. (original) The method of claim 8 wherein said first and said additional frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{1}{TE}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

11. (original) The method of claim 1 wherein determining the value of said property of interest further comprises summing said first and said additional measured signals.

12. (original) The method of claim 1 wherein said first and said additional signals have a signal loss of less than 0.8% relative to a signal that would be obtained at a nominal frequency corresponding to said first and said additional frequencies.

13. (original) The method of claim 1 wherein the property of interest is at least one of (i) a T_2 distribution, (ii) a T_1 distribution, (iii) a porosity, (iv) a bound fluid volume, and (v) a bound volume irreducible.

14. (previously presented) The method of claim 1 wherein said first and said plurality of additional frequencies are discretely sampled and wherein determining said value of said property of interest further comprises forming a weighted summation of said measurements at said first and said additional frequencies.

15. (Previously presented) The method of claim 14 wherein said forming of said weighted summation further comprises minimizing a noise in an echo measurement.

16. (currently amended) A Nuclear Magnetic Resonance (NMR) apparatus for use in a borehole an earth formation comprising:

(a) a magnet ~~for producing~~ configured to produce a static field in a region of said earth formation, said magnet aligning nuclear spins in said region substantially parallel to a direction of said static field;

(b) a transmitter ~~for applying~~ configured to apply radio-frequency (RF) pulse sequences at each of at least three different frequencies;

(c) a receiver ~~for receiving~~ configured to receive at least three signals resulting from said at least three pulse sequences, said at least three signals comprising (A) a non-NMR signal, and, (B) NMR signals resulting from interactions of said RF pulses with the earth formation; and

(d) a processor ~~for determining~~ configured to determine from said at least three received signals an estimate of a property of interest of said earth formation, said estimate substantially unaffected by said non-NMR signal wherein said first and said additional frequencies are related by an expression of the form:

$$\underline{nf \cdot \delta f = \frac{m}{t}}$$

where δf is a separation of frequencies, nf is the number of frequencies, m is any integer that is not a multiple of nf, and t is a time over which a phase difference evolves.

17. (Currently amended) The apparatus of ~~claim 42~~ claim 16 wherein said at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

18. (currently amended) The apparatus of ~~claim 42~~ claim 16, wherein at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{1}{TE}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is a interecho spacing.

19. (Previously presented) The apparatus of claim 16, wherein phases of said non-NMR signals resulting from said at least three pulse sequences are substantially evenly distributed around a unit circle.

20. (original) The apparatus of claim 16 wherein at least one of said three pulse sequences comprises a CPMG sequence.

21. (original) The apparatus of claim 20 wherein said at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

22. (Previously presented) The apparatus of claim 20, wherein at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{1}{TE}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

23. (previously presented) The apparatus of claim 16 wherein at least one of said at least three pulse sequences comprises a modified CPMG sequence having a refocusing pulse with a tipping angle less than 180°.

24. (original) The apparatus of claim 23 wherein said at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

25. (Previously presented) The apparatus of claim 23, wherein at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{1}{TE}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

26. (Currently amended) The apparatus of claim 16 wherein said processor ~~determines~~ <u>is configured to determine</u> said value by summing said at least three received signals.

27. (currently amended) A system for estimating a property of interest of an earth formation comprising:

(a) a logging tool including a magnet ~~for producing~~ configured to produce a static field in a region of said earth formation, said magnet aligning nuclear spins in said region substantially parallel to a direction of said static field;

(b) a transmitter on said logging tool ~~for applying~~ configured to apply radio frequency pulse sequences at each of at least three frequencies;

(c) a receiver on said logging tool ~~for receiving~~ configured to receive signals resulting from interaction of said at least three pulse sequences with said earth formation, said signals indicative of a property of said earth formation, said signals including non-NMR signals resulting from an excitation pulse and a refocusing pulse in said at least three pulse sequences;

(d) a conveyance device ~~for conveying~~ configured to convey said logging tool into a borehole in said earth formation;

(e) a processor in electrical communication with the transmitter and the receiver, said processor programmed to perform steps for determining from said at least three received signals a value of ~~a~~ said property of said earth formation, said determined value of said property substantially unaffected by said non-NMR signals;

wherein said at least three frequencies are related by an expression of the form:

$$nf \cdot \delta f = \frac{m}{t}$$

where δf is a separation of frequencies, nf is the number of frequencies, m is any integer that is not a multiple of nf, and t is a time over which a phase difference evolves.

28. (original) The system of claim 27 wherein said conveyance device comprises a wireline.

29. (original) The system of claim 27 wherein said conveyance device comprises a drillstring.

30. (original) The system of claim 27 wherein said conveyance device comprises coiled tubing.

31. (original) The system of claim 27 wherein said processor is programmed to select the at least three frequencies according to an expression of the form:

$$nf \cdot \delta f = \frac{2}{TE} = \frac{1}{TE/2}$$

where nf is the number of frequencies, δf is a separation of frequencies and TE is an interecho spacing.

32. (original) The system of claim 27 wherein said processor is at a surface location.

33. (original) The system of claim 27 wherein said processor is at a downhole location.

34. (original) The system of claim 27 wherein the processor is programmed to instruct the transmitter to transmit at least one of said at least three pulse sequences as a CPMG sequence.

35. (original) The system of claim 27 wherein the processor is programmed to instruct the transmitter to transmit at least one of said at least three pulse sequences as a modified CPMG sequence having a refocusing pulse with a tipping angle less than 180°.

36. (original) The system of claim 27 wherein said processor is programmed to determine said value by summing said at least three received signals.

37. (original) The system of claim 27 wherein said property is at least one of (i) a T_2 distribution, (ii) a T_1 distribution, (iii) a porosity, (iv) a bound fluid volume, and, (v) a bound volume irreducible.

38. Canceled

39. Canceled

40. Canceled

41. (Previously presented) The apparatus of claim 16 wherein said non-NMR signal is at least one of (A) ringing resulting from an excitation pulse in said RF pulse sequences, and, (B) a ringing resulting from a refocusing pulse in said RF pulse sequences.

42. Canceled